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Fig. 1

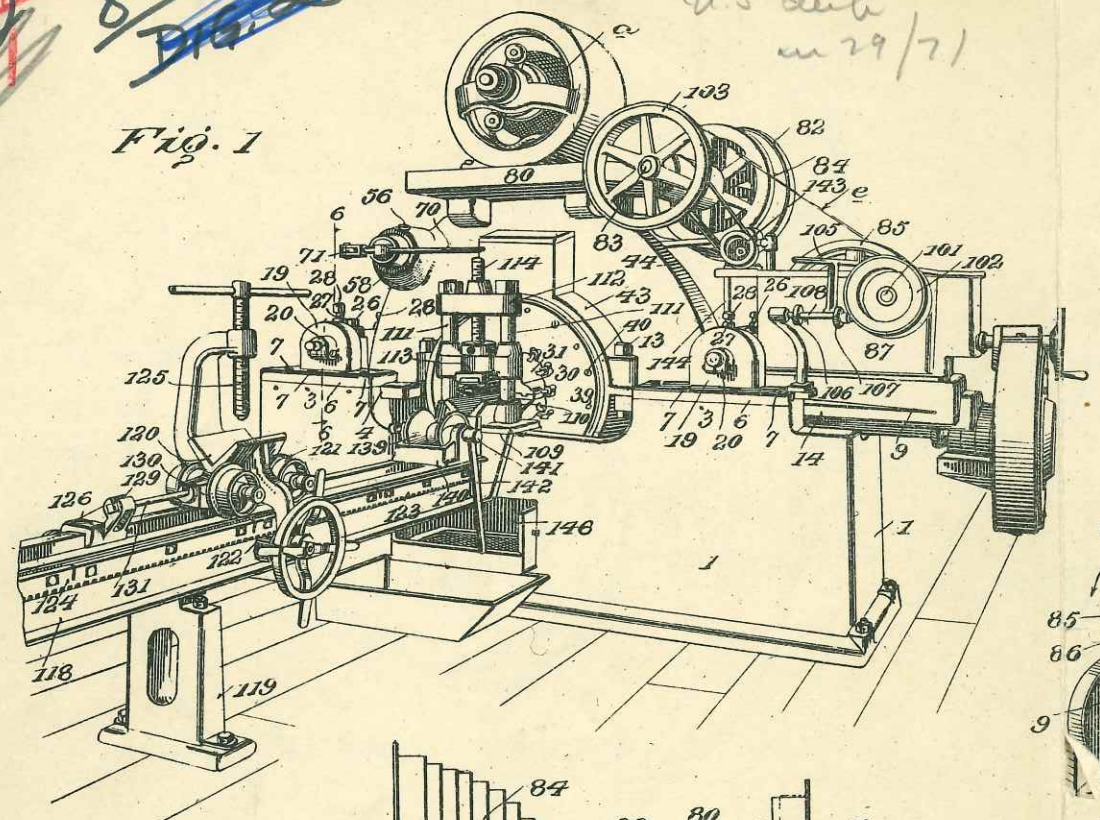

Fig. 2.

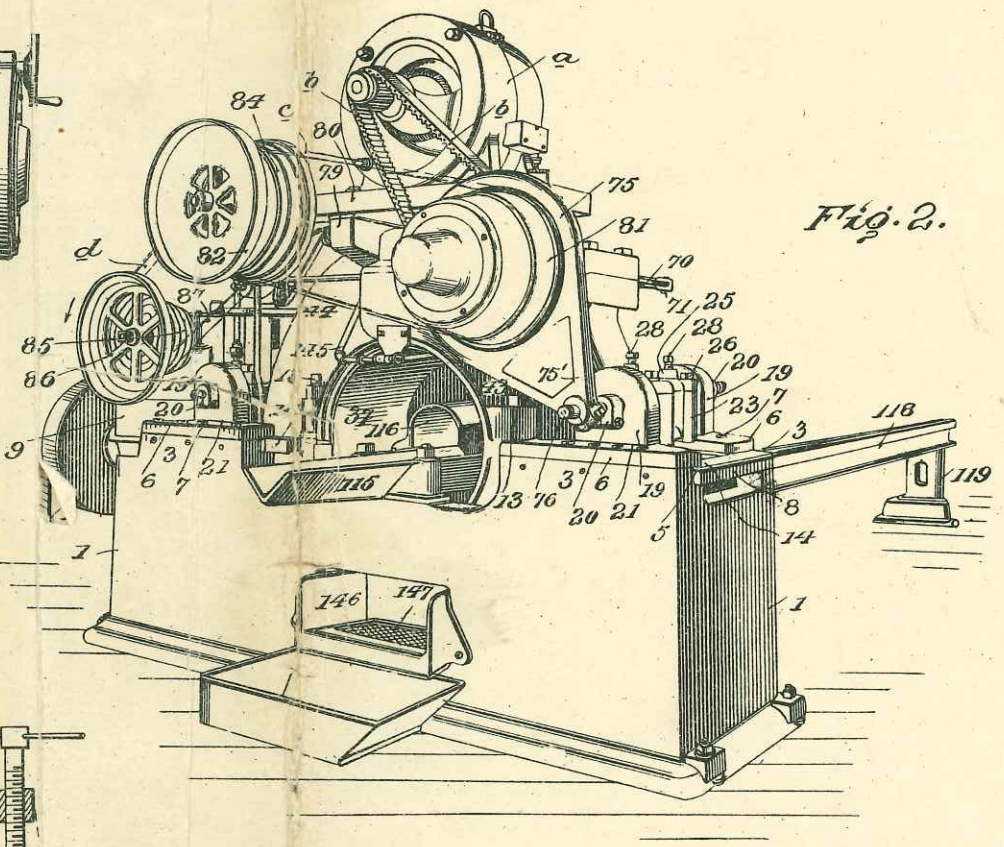

Fig. 4.

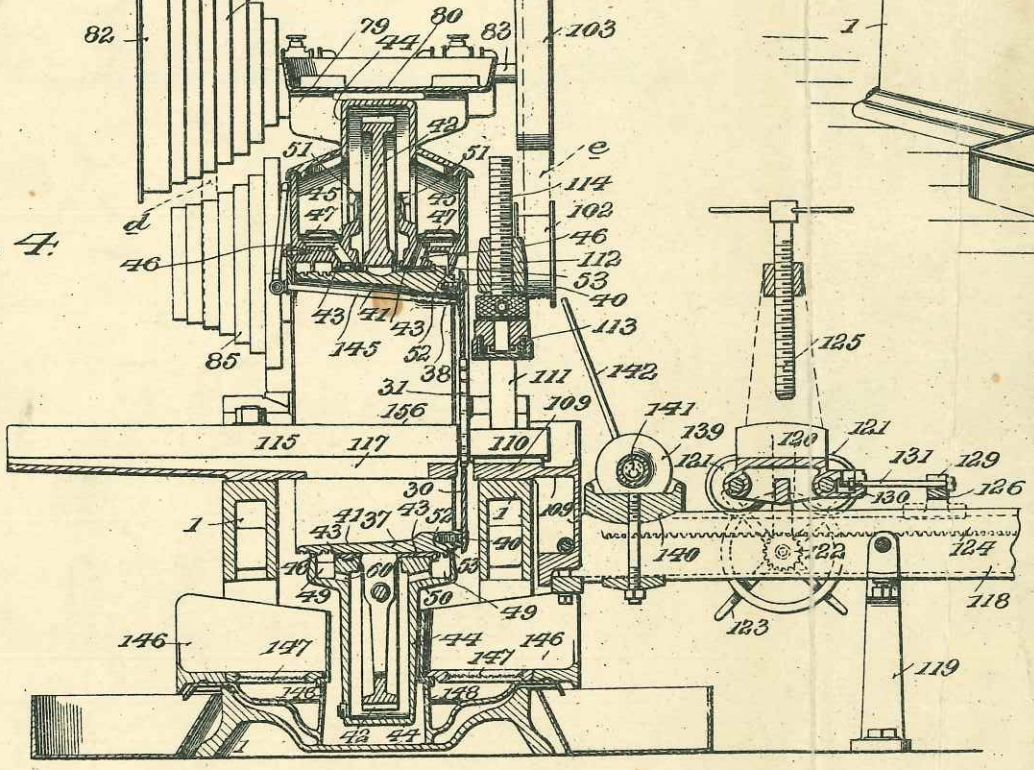

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Fig. 3.

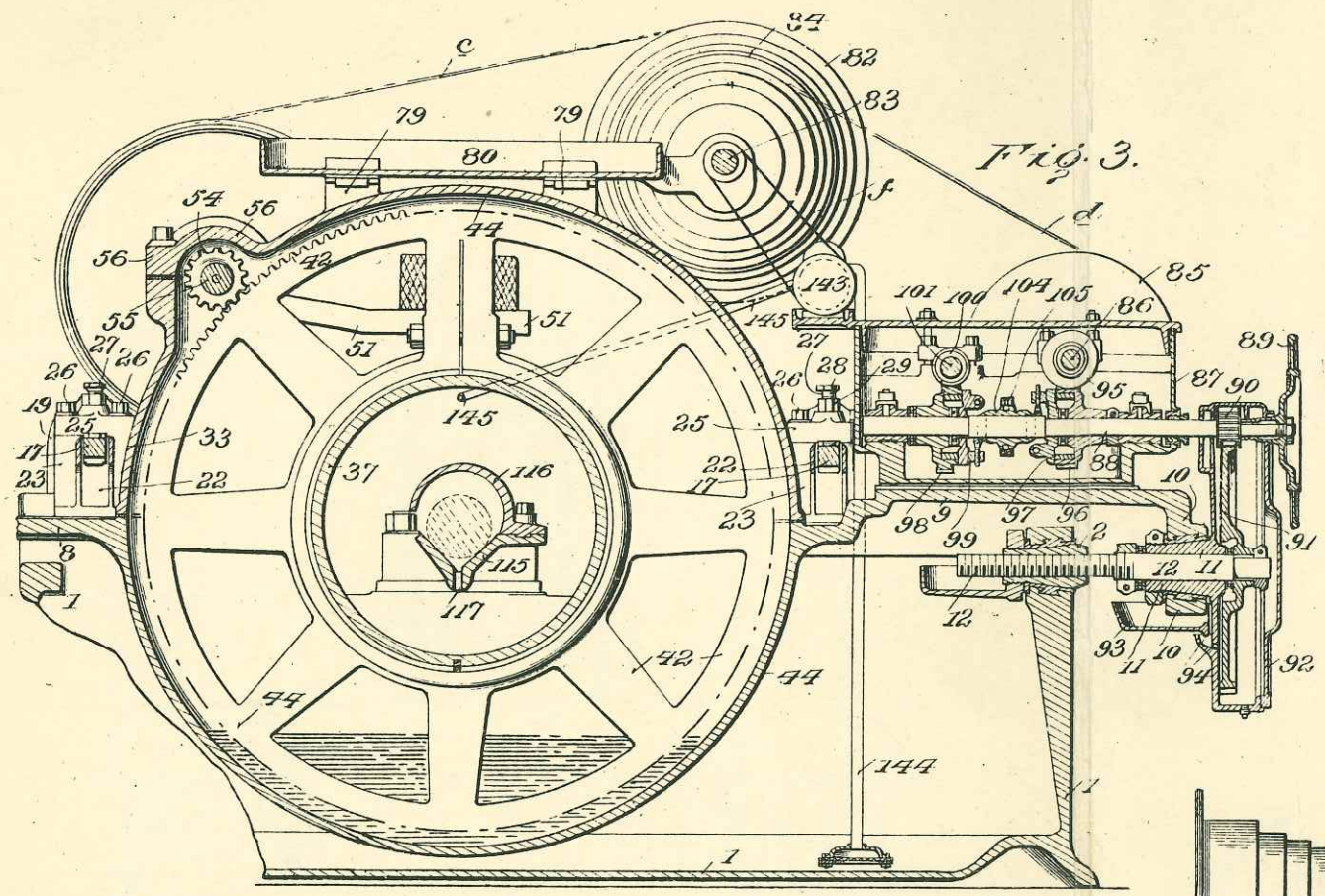
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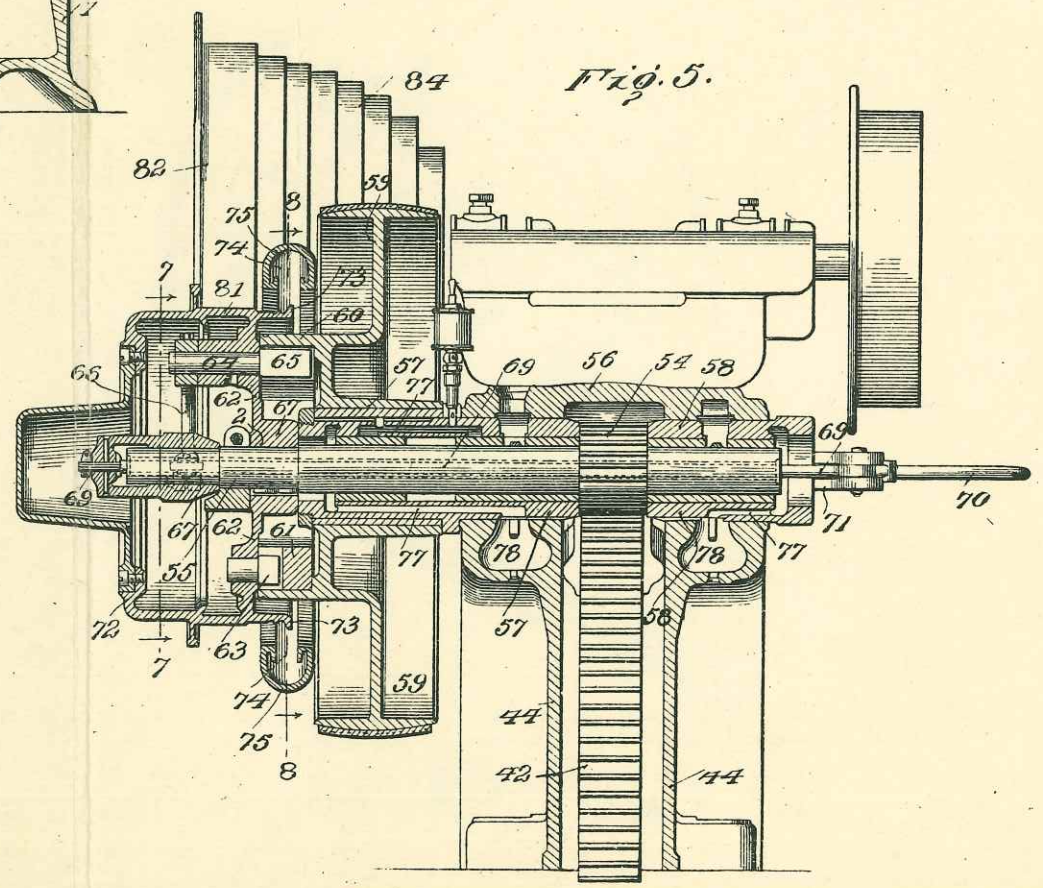
Fig. 5.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A.D. 1910. Aug. 23. No. 19,680.
GORTON'S Complete Specification.

[This Drawing is a reproduction of the Original on a reduced scale.]

SHEET 3.

Fig. 6.

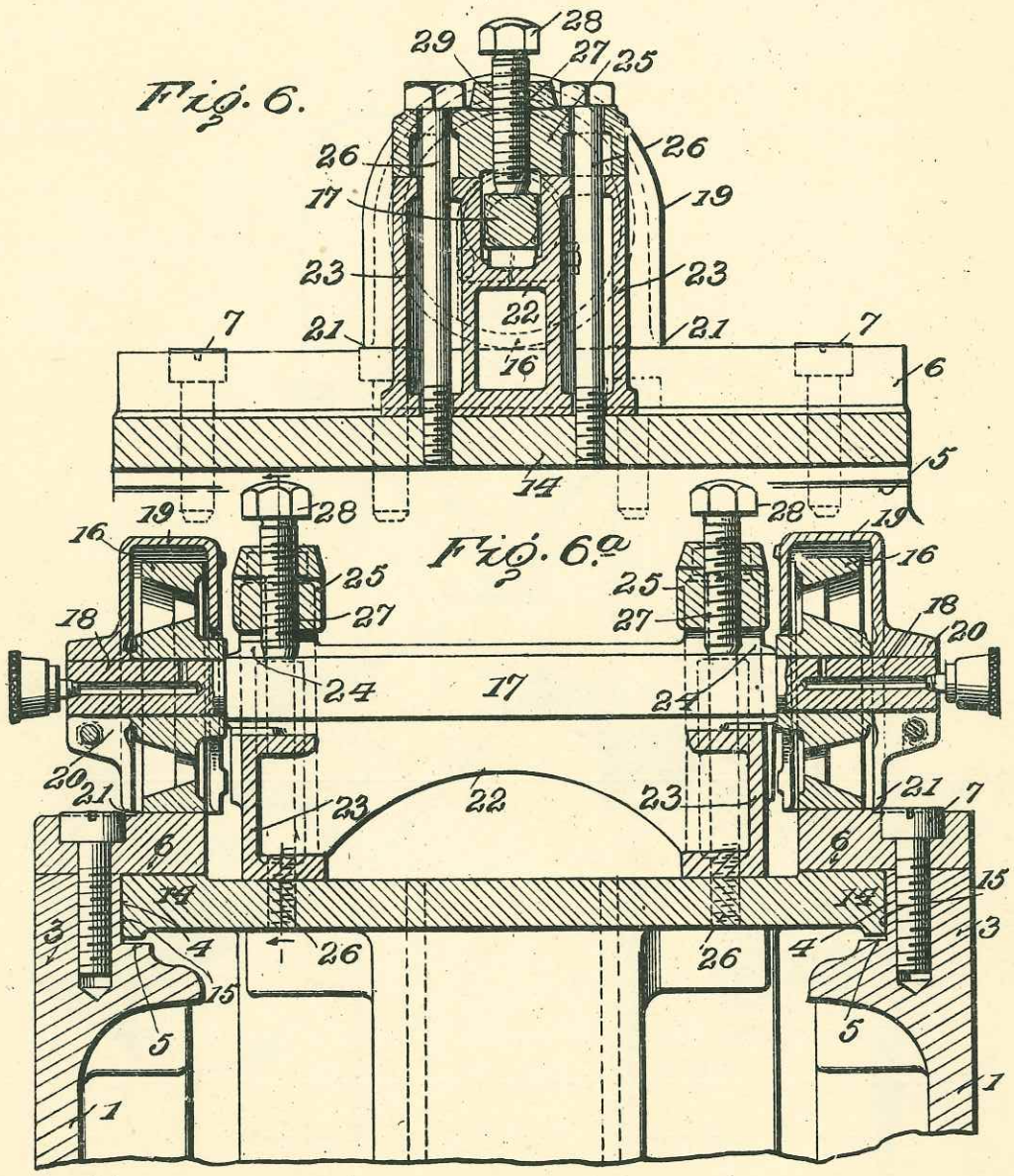

Fig. 6a.

SHEET 4.

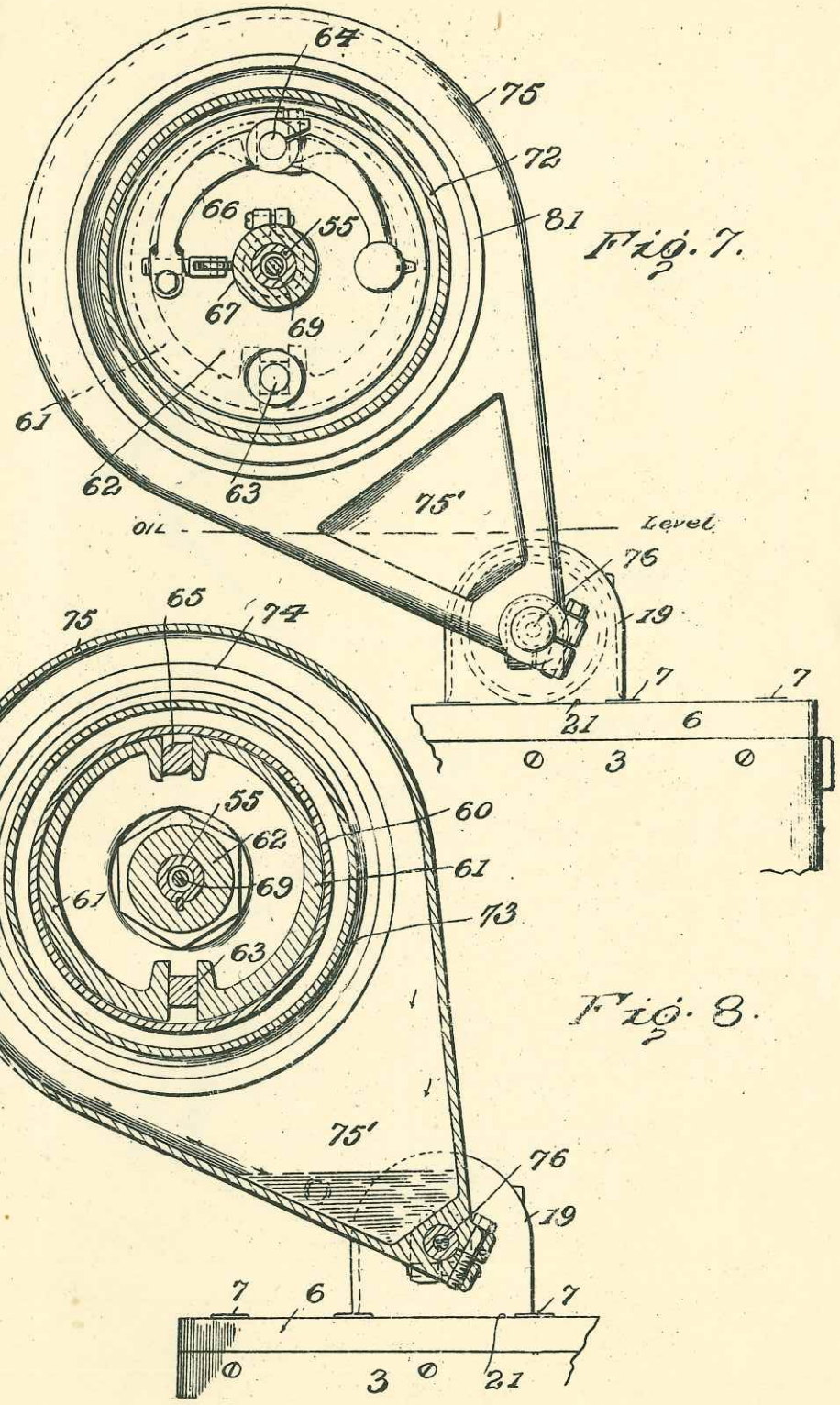

Fig. 7.

Fig. 8.

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SHEET 5

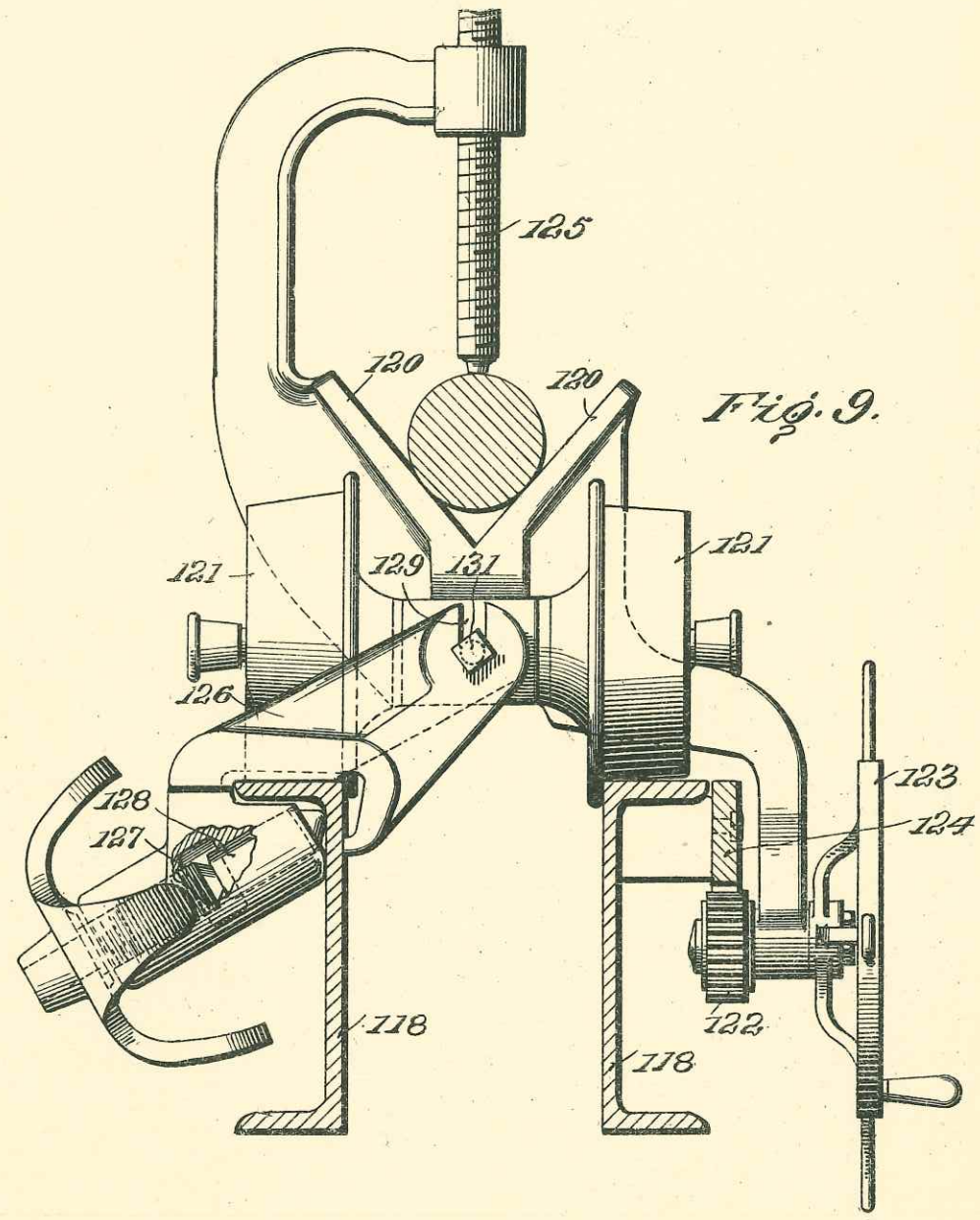
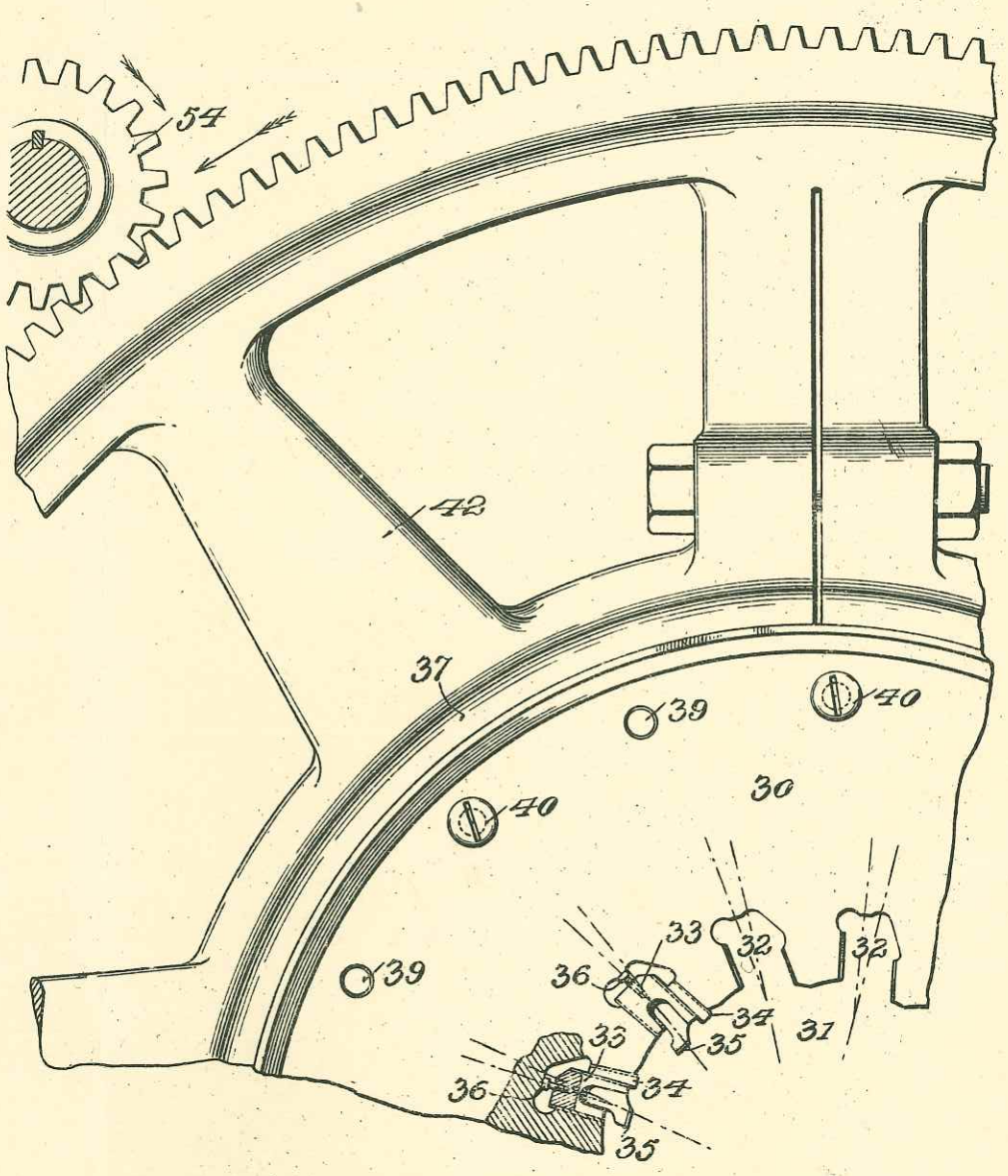


Fig. 9.

SHEET 6.

Fig. 10.



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29-71

N° 19,680 A.D. 1910

(*Under International Convention.*)

Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in the United States of America), 28th Aug., 1909

Date of Application (in the United Kingdom), 23rd Aug., 1910

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative

Accepted, 17th Nov., 1910

COMPLETE SPECIFICATION.

Improvements in and relating to Metal Cutting Off Machines and the like.

I, GEORGE GORTON, of Racine, County of Racine, State of Wisconsin, United States of America, Manufacturer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention resides in certain improvements in and relating to metal cutting-off machines, and the like.

Referring to the accompanying drawings which illustrate what I now consider my preferred embodiment from among other constructions, arrangements and combinations within the spirit and scope of my invention,

Figure 1, is a front perspective view of the cutting off machine.

Figure 2, is a rear perspective thereof.

Figure 3, is a central vertical longitudinal section through the machine taken in the direction of the line of feed and transversely of the axis of rotation of the cutting blade or disk.

Figure 4, is a vertical section transversely through the machine and centrally through the cutter blade drum and in the plane of the axis of rotation thereof.

Figure 5, is a vertical section through a portion of the machine, taken in the plane of the axis of rotation of the driving pinion shaft and the driving clutch thereon.

Figure 6, is a detail section taken longitudinally of the feed carriage through means for supporting and adjusting the same.

Figure 6a, is a detail cross section taken in the plane of the line 6—6, Figure 1.

Figures 7 and 8, are detail sectional views particularly illustrating details of the main clutch, said views being taken respectively on the lines 7—7, and 8—8, Figure 5.

Figure 9, is a detail vertical cross section through the trolley track showing the stock feeding trolley movable thereon.

Figure 10, is a detail view enlarged, showing portions of the cutter blade and its insertible cutters and driving means.

The machine of this invention is particularly designed for cutting off or severing into lengths bars of steel or other metal and is peculiarly adapted for cutting off heavy or thick bars of steel at a comparatively high rate of speed.

[*Price* 8*d*.]

The machine of my invention provides a drive or means whereby "high speed" or "high duty" steel cutters can be driven approximately to their full capacity for the rapid severing of heavy, thick (as well as small) hard (as well as soft) metal bars. To this end, I arrange renewable or removable high speed cutters, around and projecting into the central work receiving opening of a rotary carrier, disk, blade or drum mounted in a feed carriage and having an exterior driving gear or wheel of comparatively large diameter.

Heretofore, it has been proposed to cut saw teeth around the edge of a central opening in a peripheral-driven disk to perform the functions of a hack saw for cutting tubes and small or soft stock but such devices to the best of my information and belief never went into use because of the inefficiency, slowness and cost thereof as compared with the cheap power hack saws and the small inexpensive saws thereof.

Center driven rotary saws having high speed steel insertible teeth wedged in pockets in the periphery thereof, have been used for cutting off steel and other bars, but such saws are slow in action and expensive to operate and maintain because of the center drive and the tendency of such saws to vibrate or chatter and "snake" or deflect laterally, and thereby shake the inserted teeth loose and from the blade. In these old center driven saws there is a short leverage on the work, and the act of wedging up one tooth in the periphery of the blade tends to loosen the other teeth therein. This old type of saw cannot operate at a speed anywhere near the capacity of the modern "high duty" steel cutters, and hence there is great inefficiency in the operation thereof.

Generally speaking, the machine comprises a strong heavy base, a movable feed carriage supported thereby and usually carrying the working parts of the machine and the driving and transmission gearing and a rotating cutter blade or disk having a central opening surrounded by the cutters, and means are provided for supporting and holding the work while being operated upon by the cutters.

In the specific example illustrated, I show a strong heavy base 1, in the form, generally, of a horizontally elongated or oblong box open at the top and forming a tank or receptacle. If so desired, this heavy base can be formed by a single hollow casting, although of course my invention is not so limited, nor is it limited to the particular form or arrangement of base shown.

One end wall of the base is formed with an opening extending transversely therethrough to receive the nut 2, for the feed screw operating the carriage longitudinally of the base. The central top portions of the longitudinal or front and rear walls of the base are depressed opposite the cutter blade or disk for the reception of the devices for holding the work.

The four top portions 3, of the longitudinal or side walls of the base, intervening between said central depressions and the end walls, are constructed or arranged to form longitudinal parallel horizontal track and slide ways for the reciprocating feed carriage and whereby the same is supported and maintained to reciprocate in its proper path of movement. These portions 3, are formed with longitudinal parallel inner vertical faces 4, terminating in depressed inner longitudinal horizontal ledges or shoulders 5. The horizontal top longitudinal edges of the portions 3, are parallel with and of the same lengths, usually as the shoulders 5, and are separated therefrom by distances equal to the height of the vertical faces or walls 4. Strong heavy metal caps or plates 6, are rigidly and strongly fixed as by bolts 7, on the horizontal top edges of the portions 3, so as to project inwardly and horizontally beyond the same and above and parallel with the ledges or shoulders 5, and be separated therefrom vertically. The four caps 6, are arranged longitudinally of the base and are horizontal and parallel with each other and are formed flat at their top and bottom faces to form tracks for the carriage supporting rollers and slideways for the longitudinal sliders or flanges of the carriage, as hereinafter set forth.

The cutter blade or disk feed carriage is arranged and movable longitudinally

within the base and at its opposite end portions is supported therein or thereby, and at its central or intermediate portion is provided with the cutter disk and its carrying and driving drum, arranged between the reduced central top portions of the longitudinal side walls of the base. The main body of the carriage, in the specific example illustrated, is formed by a single casting having the horizontal longitudinal rear end 8, and the horizontal longitudinally elongated front end 9, having a depending end portion 10, carrying the thrust bearing 11, for the horizontal longitudinally arranged rotary feed screw 12, meshing with the feed nut 2, fixed in the upper part of the front end wall of the base, and whereby the feed carriage is reciprocated. The intermediate portion of the length of said main body of the carriage, is arranged longitudinally between the side walls of the base and its side faces are spaced from the inner faces of said base side walls, and forms and constitutes the lower half or section of the cutter blade drum housing or journal box and the lower half of the drum gear box or housing. In the specific example illustrated, the upper half or section of the journal box for said drum and of said gear box or housing is formed by a separate casting secured by suitable bolts, such as 13, to the main body or casting to form and constitute the complete journal box and gear housing as fully set forth hereinafter.

The longitudinal end portions 8, 9, of the carriage are arranged between the upper end portions 3, of the vertical side walls of the base, and at their opposite longitudinal side edges are formed with properly scraped or shaped longitudinal parallel horizontal sliders, flanges or edge rails 14, arranged beneath the caps 6, and above the shoulders 5, and having their longitudinal vertical outer edge walls 15 parallel with and opposed by the vertical walls 4, of the base. The longitudinal horizontal top faces of said sliders 14, are adapted to engage and slide along the overhanging bottom faces of the caps 6, and the horizontal bottom faces of said sliders 14 should be elevated a slight distance above the horizontal shoulders or ledges 5. The caps 6, through the medium of the sliders 14, maintaining the carriage against upward movement from its desired horizontal path of reciprocation while the walls or faces 4, maintain the same against lateral deflection from said path, and the shoulders or ledges 5 will uphold the carriage or limit the downward movement or adjustment thereof. In other words, the range of vertical adjustment of the carriage is limited to the distance, usually a slight fraction of an inch, between the ledges 5 and the bottom faces of the carriage sliders or flanges 14. In the specific example illustrated, the carriage is supported or upheld by wheels or rollers 16, (four in the present instance) travelling longitudinally of the horizontal top faces of the overhanging portions of the caps 6, that is immediately above the sliders 14. These rollers 16, are arranged in pairs, and are mounted loosely on two horizontal axles 17, arranged transversely of and above the end portions of the carriage and projecting over the base caps 6, that form the trackways for the rollers. Each axle at its opposite ends is formed with end journals 18, to receive and form the bearing journals for the hubs or boxes of the rollers 16 and the axle is usually squared between the said end journals. The axle end journals 18, are elongated so as to project outwardly beyond the roller hubs to receive removable collars clamped on the journal ends to confine the rollers in proper position thereon. I show these collars formed with end carrying shields or housings for the truck wheels or rollers 16. Each housing is cast or otherwise formed as a hollow metal box or body 19, to enclose a truck wheel, and formed at its outer or front wall with a split collar 20, to receive the projecting end of the axle journal 18, and having a clamping screw whereby said collar can be rigidly clamped on the axle to fix the housing thereto enclosing the wheel and limiting the outward movement of the wheel on the axle. The inner vertical wall of the housing is vertically slotted to slip down over the axle at the inner face of the wheel. The box is open at the bottom and said open bottom is surrounded by the horizontal bottom edge 21 of the housing

moving above and in close proximity to the trackway on which the roller travels to sweep said trackway clear of chips or other obstructions over which the wheel might pass or which might tend to obstruct the passage of the wheel.

Suitable means are provided for hanging or supporting the feed carriage from the axles 17, and for vertically adjusting the carriage with respect to said axles and the truck wheels. For instance, I provide two chairs, supports or pillars for each axle and arranged respectively, adjacent to the two wheels of the axle. The chairs for each axle are shown as comprising a web 22, extending horizontally and transversely of and above a carriage end, and at its ends formed with vertical pillars or heads 23, at their lower ends or edges formed to seat on the top face of the carriage end adjacent to the flanges or sliders 14 thereof and also adjacent to the inner vertical longitudinal edges of the base caps 6. The web 22, is formed with a longitudinal top groove or channel, open at the top for the passage of the axle and this groove at its opposite ends opens through the heads 23 at 24. This groove is of sufficient vertical depth to receive the axle and permit limited vertical movement of the axle within the groove or of the support or chair independently of the axle; and said groove is formed to prevent lateral play of the axle within the chair or support therefor.

Strong caps 25, are arranged on the horizontal upper ends or edges of the heads 23, across the guide openings 24, therethrough and above the end portions of the axle and these caps are secured to said heads and the support or chair, consisting of the web and the two heads, is rigidly secured to the carriage end by four (more or less) vertical bolts 26, passed down through the ends of the caps 25 and through the heads 23, and into the carriage. The device as so far described would support the carriage from the axle by the caps 25 resting on the axle, but to provide for vertical adjustment of the carriage with respect to the two axles and four truck wheels, I provide four heavy strong set screws 27, adjustable vertically through the caps 25 and at their lower ends bearing on the top faces of the end portions of the axles, whereby the carriage is supported by the four set screws, each axle being engaged by two screws, and each screw is provided at its upper end with an exposed readily accessible head 28, and usually with a jam nut 29.

By this arrangement, the vertical position of the carriage can be easily and quickly adjusted to a nicety by simply manipulating the four set screws 27, to even up the carriage and bring the sliders 14 thereof up to the under faces of the base caps 6, with the desired degree of accuracy. Until the supporting axles and parts are applied, the carriage will rest on the base shoulders or ledges 5, and after the axles have been applied and the caps 25 properly secured, the carriage is raised to the desired adjustment by the four set screws.

Material advantages in operation and result are attained by thus mounting the carriage on truck rollers, generally about as described, as the feed screw and transmission are thereby relieved of excessive strain, particularly in view of the fact that in a machine of this character, the feed carriage and parts carried thereby are exceedingly heavy. Furthermore, great saving in expense of manufacture is attained by employing a carriage mounting generally about as described, inasmuch as a great deal of expensive machine work and planing for accurate fitting at slideways are avoided, all as will be readily understood by those skilled in the art.

The metal cutting and severing element rotates in the feed carriage and is carried thereby through or across the work and this element has a central work receiving opening and is provided with renewable or removable metal cutters arranged around and projecting into said opening. Among various means which can be employed for this purpose, I show a flat circular hard steel (or other suitable metal) blade or disk 30 having a central work or stock receiving opening 31, and renewable or attachable cutters wedged or otherwise fixed thereto and having cutting or working points or edges 35, projecting into said opening and composed of "high speed" or "high duty" steel or steel alloy, that is,

steel of such composition or so treated in the process of manufacture as to be capable of cutting hard and soft metals at a very high rate of speed and under rapid feed without fusing or rapid loss in efficiency, as is well understood by those skilled in the art.

High duty cutters of various construction and formation can be employed and these cutters can be wedged or locked to the blade around its central opening by various devices and provisions, and I do not claim to be the inventor of the particular cutter 33, *per se* shown in the drawing and secured by wedges 34, and having adjustable stop screws 36. I merely show such old cutters of commerce for convenience in illustration, although I claim to be the first to secure renewable high speed cutters of any construction around and projecting into the central work receiving opening of a rotary holder or blade whether such cutters are wedged in pockets 32, or are otherwise wedged or locked to the inner edge of the blade against lateral deflection and are properly supported to sustain the thrust of the cutters while at work, and whatever the specific construction of the renewable or attachable cutter.

This cutter disk or blade 30, is carried and driven by and is secured to the front edge of a horizontally disposed open or cylindrical rotary drum 37 arranged transversely of and within the feed carriage between the longitudinal or vertical side walls of the base and at its end edges spaced from the inner vertical faces of said base side walls. The front vertical end edge 38, of this drum is arranged flat and in one plane to receive and fit against the inner face of the disk 30, usually with the disk edge projecting radially beyond the drum surface. The edge 38, of the drum is provided with a circular series of spaced studs or pins 39, fixed to the drum and projecting longitudinally from said edge to removably fit in correspondingly arranged perforations or holes extending transversely through the disk 30, and said edge 38, of the drum is formed with a circular series of tapped holes or sockets to removably receive headed machine screws 40, removably passed transversely through the disk, with their heads countersunk therein, and by which the disk is removably and yet most rigidly secured to the edge of the drum. If so desired, the circumferential edge of the disk can be beveled off about as shown. The disk which is usually composed of hard steel can thus be readily removed from or applied to the drum from the front side of the machine, and the central or working opening of the disk is concentric with the drum or with its axis of rotation, which axis of rotation of the drum and disk is transverse of the base and feed carriage and arranged about in the horizontal plane of the flanges or sliders of the carriage, and above the top edges of the depressed central portions of the vertical side walls of the base.

The interior surface 41, of the drum is shown tapering off or flaring from the front toward the rear open end of the drum to facilitate the discharge of the cooling fluid from the interior of the drum at its rear end into the tank or receptacle formed by the hollow base.

42, is the main driving gear through which the drum is rotated and this gear is operatively rigid with the drum and arranged exteriorly thereof and about midway between the ends thereof. The drum forms the gear hub, and although in the example shown, the gear is clamped on and keyed to the drum, yet the gear might be cast in one piece with the drum, or otherwise secured rigid therewith.

The opposite ends of the disk-carrying drum are mounted and supported in journal boxes 43 exteriorly surrounding the drum at opposite sides of the exterior drum driving gear 42, and between and rigid with these boxes 43 and connecting the same and carried thereby, is a gear box or casing 44, enclosing the gear 42. The lower halves of the drum journal boxes 43, and of the gear box 44, in the specific example illustrated, form a part of the main or body casting of the feed carriage and depend into the hollow base, while the upper halves of boxes 43 and 44 are formed in one casting constituting the cap placed

on the main or body casting of the carriage and secured by the bolts 13, hereinbefore referred to. The top or cap casting is shown formed with oil chambers 45 on top of the two boxes 43 and on opposite sides of the top portion of the gear box 44 with side openings through the side walls of the gear box into said oil (or other fluid lubricant) chambers 45. Oil ducts 46 extend down from the bottom of chambers 45 to the top portions of the bearing surfaces of the journal boxes 43 to lubricate the disk-carrying drum. If so desired, oil filtering material 47, can be arranged in the bottoms of the oil chambers 45 for filtering the oil before it is passed to the drum bearings.

Near its opposite end portions, the exterior of the drum can be formed with annular oil grooves 48, and the outer end portions of the journal boxes with annular oil catching ducts or passages or grooves 49 to catch the oil escaping outwardly from the journal boxes and deliver the same into the oil supply receptacle formed by the lower portion of the gear case 44, through the oil ducts 50, from the lowest portions of oil catching channels 49 and opening through the opposite side walls of the gear case 44. The desirable quantity of lubricating oil will be maintained in the gear box 44, and the gear 42 revolving therein will elevate oil which dropping from the upper part thereof will be caught by the oil ducts or deflectors 51 and delivered laterally through the side openings into the oil chambers 45, whereby the disk-carrying drum will be constantly supplied at its bearings with an ample supply of lubricant, and the same body of oil is used over and over again.

If so desired, the front end of the drum can be exteriorly and circumferentially rabbetted, at 52, and the front journal provided with an exterior annular inwardly projecting flange or lip 53, forming a running joint with said rabbetted portion to prevent leakage of lubricating oil around the cutter disk.

Fresh supplies of oil can be introduced into the lubricating system thus described, through the open tops of the oil chambers 45, normally closed by removable covers or lids.

The cap of the feed carriage comprising the upper half of the gear box 44 is formed to carry the pinion 54, driving gear 42, and the shaft, driving pulley and clutch therefor. The pinion 54, for driving and meshing with gear 42, is carried by elongated pinion shaft 55, and this pinion is shown arranged at the upper portion of the gear 42 about midway between the horizontal and vertical diameters of the gear 42. Usually the pinion 54 is located about at that point of the periphery of the gear 42, farthest removed from the point of application of the disk cutters to the work.

The upper portion of the gear box or case 44, is cast or otherwise formed with a transverse open end housing 56, usually split and provided with a clamping bolt, to receive and tightly hold bearing sleeves 57, 58, arranged at opposite ends of the pinion 54, respectively and receiving the portions of the shaft projecting in opposite directions from the pinion. The rear end of the bearing sleeve 57, projects beyond the gear case housing 56, and forms a stud on which the driving pulley 59 is mounted to freely revolve. The driving pulley 59 is formed with an annular concentric rearwardly projecting clutch flange 60, containing an expansible split spring clutch ring or shoe 61, normally contracted from operative frictional engagement with said flange so that the pulley 59 normally runs as an idler. The split spring clutch ring or shoe 61, is carried by and arranged to revolve with and drive a clutch disk or flange 62, keyed or otherwise fixed to the end of the pinion shaft projecting rearwardly beyond the bearing sleeve stud 57. The normally contracted clutch ring is confined to the clutch disk 62 by any approved means, such as stud 63. The clutch disk 62, carries suitable means for expanding the split ring 61, into frictional driven engagement with the pulley flange 60, for the purpose of locking the clutch disk 62, and the pinion shaft to the driving pulley 59 to be driven thereby. For instance, I show rock shaft 64, mounted to rock in the clutch disk and having beveled headed end 65, arranged between the ends of the

clutch ring 61, and arranged and formed so that when rocked from its normal position, it will engage said ring ends and force the same in opposite directions and away from each other and thereby expand the ring into locking position and against its spring tension. In the example illustrated, the shaft 64, is rocked by and is provided with a depending or crank arm 66, fixed on the projecting outer end of the shaft and at its lower end provided with a roller yieldingly held in engagement with a longitudinally movable cone 67, forming a cap covering the end of and slidable on the exterior of the projecting rear end of the pinion shaft 55, which rotates freely in the cone. Suitable means are provided for moving said cone longitudinally of the shaft to throw the shaft into and out of gear with its driving pulley 59, and consequently to throw the cutter disk drum into and out of driving connection with its driving means. For instance, I show the pinion shaft 55, hollow throughout its length with a pull rod 69, extending therethrough and movable longitudinally therein and at its rear end coupled to the rear portion of the cone 67, to move the cone longitudinally on the pinion shaft. At its projecting front end said pull rod is pivotally joined to a hand lever 70, arranged and accessible at the front of the feed carriage above the cutter disk and suitably fulcrumed to arm 71.

In the example illustrated, I show the clutch disk 62 (keyed to the shaft 55) formed with an oil box or drum 72 extending rearwardly therefrom and enclosing the portion of the shaft projecting rearwardly from said disk and the cone and other parts thereon and adapted to receive a suitable quantity of oil for maintaining the lubrication of the clutch and operating parts and adjacent surfaces where it is possible for the oil from said box to work thereto. At its forward end and spaced from and surrounding the clutch flange 60, of the drive pulley, I show said oil drum formed with an annular exterior oil throwing flange or lip 73 adapted to receive the oil escaping from the clutch and between the drive pulley 59 and the clutch disk 62 and throw the same centrifugally into the narrow inlet slit or slot 74, of an oil catching ring 75 surrounding and spaced from said flange 73, and formed hollow or U-shaped in cross section to catch the oil thus thrown and retain the same and deliver said oil into a receptacle 75^1, forming a part of said ring and into which the same opens. The receptacle is provided at its lower portion with a suitable normally closed outlet through which the oil can be drawn off when desired. The oil catching ring and receptacle constitute a single element or device supported independently of the flange 73. The receptacle and ring are shown supported by and removably clamped on a stud 76, from a part of or carried by the feed carriage.

The bearing sleeves 57, 58, for the pinion shaft are provided with suitable oiling ducts 77, distributing the oil from suitable sources to the pinion shaft bearings, and the oil escaping from said bearings is delivered into oil pockets 78, formed in the bottom portions of the housing 56, and provided with means whereby the oil can be drawn therefrom.

The cap forming the upper portions of the drum journal boxes and the gear box for the drum driving gear, can be cast or otherwise provided with brackets 79, to which the motor supporting pan or base 80, is bolted where it is desired to mount the machine driving motor *a*, on the feed carriage.

Driving power for rotating the cutter disk is transmitted from the motor *a*, to the drive pulley 59 through any suitable medium, such for instance, as the driving belt *b*.

The feed carriage is also actuated, if so desired, on its feeding and return reciprocations, through the medium of said driving belt *b*, pulley 59, and the clutch mechanism hereinbefore described, so that the feed carriage will be stopped and started with the cutter disk, so that said clutch constitutes the main clutch of the machine. To accomplish this end, the oil drum and the clutch disk 62, constitute a pulley and said drum 72, is formed with an exterior driving belt receiving face 81 for actuating the feed carriage transmission through the medium of a belt *c*, or other suitable device.

Various means can be provided for varying the speed of the feeding stroke or movement of the feed carriage, although in the example illustrated, I show series of cone pulleys and a belt drive.

I show the belt *c*, from clutch pulley 81, to the drive pulley 82, of a transverse shaft 83, suitably mounted at the upper portion of the feed carriage and carrying series of cone pulleys 84, adapted to be connected by belt *d*, with the series of corresponding cone pulleys 85, to drive the same. The cone pulleys 85, are fixed on transverse shaft 88, mounted in a tight gear box 87, fixed on the front end 9, of the feed carriage. In this gear box is mounted the longitudinal feed shaft 88, projecting rearwardly from said box and at its rear extremity having hand wheel 89, fixed thereon and by which the feed carriage can be moved by hand when necessary and parts are in the proper positions or adjustments.

The feed shaft 88 is connected to rotate the feed screw 12, through the medium of suitable gearing, such as pinion 90, rigid with the rear portion of the feed shaft and the gear 91, rigid with the rear end of the feed screw. The rear end of the feed screw and the gearing 90, and 91, are enclosed in an oil tight case or box 92, fixed to and carried by the stationary thrust block 11 in which the feed screw rotates, and under which an oil catching pan 93 can be arranged to catch the drippings from the feed screw and block and deliver the same into the box or case 92, through the oil ducts 94 (Figure 3).

The shaft 86, actuates the feed carriage on its feed stroke by driving shaft 88 in the proper direction by means of screw gear 95, rigid on shaft 86, and screw gear 96, loose on shaft 88, and adapted to be coupled thereto to rotate therewith through the medium of suitable clutch 97, arranged on shaft 88 to constantly rotate therewith.

The shaft 88, is rotated in the opposite direction to move the feed carriage on its quick return stroke by screw gear 98, normally loose on said shaft and adapted to be coupled thereto to rotate therewith by clutch 99 rotating with said shaft. The gear 98, is driven by screw gear 100, on shaft 101, mounted in gear box 87, and at the exterior thereof provided with pulley 102 driven by belt *e*, from the pulley 103, on the countershaft 83.

Suitable means are provided to operatively connect either screw gear 96, or 98, with the feed shaft 88, and at the same time operatively disconnect the other screw gear therefrom, or to operatively disconnect both of said gears from said shaft should it be desired to feed the carriage by hand through the medium of hand wheel 89. As a means which might be employed for this purpose, I show double cone 104 on shaft 88, and movable longitudinally thereof and arranged between the two clutches 97, 99, and formed to actuate the clutch operating or applying devices of one clutch when shifted longitudinally in one direction, and to release said devices and operate the devices of the other clutch when thrown to its limit in the opposite direction, while when located midway its range of movement, said cone permits both clutches to be disengaged or in inoperative position. Suitable means are provided for operating or throwing this cone, such as horizontally swingable cone-throwing lever 105, fulcrumed in the gear box 87, and having an extended end at the exterior of said box movable between stops 106, and 107, carried by and adjustable longitudinally of a horizontal rod 108, arranged parallel with the direction of movement of the feed carriage and carried by a rigid arm or bracket fixed to the base (Figure 1). By this arrangement the clutches are automatically controlled to change the direction of movement of the feed carriage as will be well understood by those skilled in the art. The lever 105, can also be operated by hand when desired to shift the clutches.

Suitable means are provided for receiving and holding the steel bars or other stock or work to be severed by the cutters of the cutter disk, and for receiving and holding the section or length cut from the bar or stock.

For instance, I show a heavy metal saddle 109, resting on the top edge of

the central part of the depressed top of the front side wall of the base and opposite the working opening in the cutter disk, and formed with a central transverse V-shaped depression 110, to receive the stock and forming the bottom or stationary jaw of a stock clamping vise. This saddle has a portion depending at the vertical outer face of said front wall of the base to receive the stock trolley rails, as hereinafter set forth.

This saddle is secured to the base by a pair of vertical upwardly extending bolts 111, passing through the opposite ends of the top portion of the saddle, and the upper ends of these bolts are connected by a strong heavy cross head 112. 113, is the vertically movable or upper jaw of the stock vise or clamp vertically movable on and guided by the bolts 111, which pass loosely through the ends of said movable jaw. 114, is the vertical screw by which the movable jaw is raised and lowered and through which it is forced down to rigidly and securely clamp and hold the stock or other work in the V-shaped depression of the lower or fixed jaw and in proper position to be operated on by the cutters of the cutter disk. The screw 114, passes through a threaded opening in the cross head which acts as a fixed nut for the screw, suitable means being provided whereby the screw can be rotated to move the sliding jaw. The fixed jaw of the vise terminates closely adjacent to the front face of the cutter disk and is so arranged that the stock resting in said jaw can pass through the working opening of said disk and extend the desired distance through and beyond the disk so that when the cutters have severed the stock, the required length of stock will be cut off and remain in rear of said disk. In order to receive and hold the length of stock projecting through and beyond the cutter disk and maintain the same after being severed, I provide an elongated strong rigid V-shaped trough 115, arranged transversely of the base and carriage and extending longitudinally into the drum and at its front edge terminating in rear of and closely adjacent to the rear face of the cutter disk and alined with the V-shaped depression of the fixed jaw of the vise, while the rear end of said trough extends rearwardly a distance beyond the rear side wall of the base. This trough rests on and is supported by and rigidly bolted to the rear side wall of the base and traverses the top edge thereof. Within the drum said trough is formed with a cooling liquid discharge slot or opening 117, through the bottom thereof, and the bottom of the trough can be longitudinally inclined to said opening so that all of the cooling liquid that enters the trough will be discharged into the drum and from the drum into the hollow base. I show the front end of this stock holder or trough provided with a shield or hood 116, rigidly secured thereto and adapted to extend over the stock closely adjacent to the working plane of the cutters while severing the stock.

In view of the considerable length and heavy weight of the stock sometimes required to be operated on by machines of this character, I have produced a trolley device or rolling carriage, and track therefor, for supporting the stock and by which the stock can be more readily manipulated and fed to the cutters than heretofore. In the example illustrated, I show a track extending from the machine in line with the trough 115, and comprising a pair of horizontal parallel spaced tracks, beams or channel irons 118, secured together and at their outer portions fixed to and upheld by one or more standards 119, and at their rear ends fitted to the front side wall of the base and secured by bolts or otherwise to the depending portion of the saddle 109, see Figure 4. A stock truck or trolley 120, is supported on this track through the medium of wheels 121, and is movable longitudinally thereof by a gear wheel 122, carried by the truck and operated by a hand wheel 123, and meshing with rack 124 arranged longitudinally of and fixed to the track. This truck is formed with a top V-shaped depression to receive the stock and with a clamping screw 125, whereby the stock can be wedged and clamped into said depression to act in conjunction with the machine vise, hereinbefore described, in holding the stock during the severing operation, if so desired, but more particularly to hold the stock to the

truck during the operation of moving the truck forward by the hand wheel when feeding the desired length of stock across the vise jaw 110, and through the working opening of the cutter disk. I provide a gage for limiting the forward stock moving movement of the stock carrying trolley to a distance equal to the length of stock to be cut off plus the width of the slot cut by the cutters. For instance, I show a block 126, extending over one of the track rails with a hooked end engaging the inner face thereof while the opposite portion of the block depends at the outer face of the rail and projects under the top flange thereof so that the block can be moved longitudinally along the rail, and can be clamped thereto in the desired position by a clamping screw 127 carried by and adjustable through the block to drive a clamping pin 128 against the rail. The upper portion of this slidable block at a point between the two rails, is formed with an open top slot 129 extending in a direction parallel with the lengths of the rails. The trolley is provided with a rearwardly extending lug 130, formed with an open top T-slot. If the stock resting on the trolley and the fixed jaw of the vise with its rear end at the cutter disk opening, is to be moved through said opening a certain distance so that the cutters will sever just the length of stock required, the block 126 is moved along the rail until it engages the rear end of the trolley, a double head bolt or link 131, of the length of bar to be fed forward plus the width of the slot cut by the cutters, is then dropped into the slots in the lug 130 and the block, and the block is clamped rigidly to the rail. The truck is then moved forward and when it has moved the required distance the heads of the link or bolt 131 engaging the trolley lug and the block, will limit further forward movement of the trolley. When the required length has been cut from the stock, the operation is again repeated, by moving the block up to the rear end of the trolley and again clamping the same. Those skilled in the art will readily understand the convenience of such a device in handling stock in metal cutting off machines.

At the front end of the track, I provide a stock supporting idler and grooved pulley or roller 139 arranged transversely above the rails and supported by a saddle 140, resting on and clamped to the rails. This roller is mounted and rotates on an eccentric portion of a shaft 141, rotatively mounted in the ends of the saddle and provided with an end hand lever 142, by which the shaft can be rocked or rotated to raise and lower the roller through the medium of the eccentric portion of the shaft within the roller. When the stock is to be moved forward across the fixed vise jaw, the shaft is turned to raise the roller and thereby lift the stock above the vise jaw so that the stock can be freely moved forward, and when the stock has been moved the required distance, the eccentric shaft is turned back thereby lowering the roller and dropping the stock onto the vise to be clamped for cutting. The operation of moving the stock is greatly facilitated by this arrangement.

The tank formed by the hollow base is adapted to receive any suitable cooling liquid for flooding the stock and cutters during the cutting operation, and hence I show a pump 143, mounted on any suitable portion of the feed carriage and operated in any suitable manner as by belt *f*, from shaft 83, and provided with a suction pipe 144, extending to the lower portion of the interior of the base, and a fluid discharge pipe 145, extending into the cutter disk drum through the rear open end thereof, and having a discharge to flood the cutters while at work. The fluid flows from the drum as hereinbefore described back to the tank formed by the base, so that the liquid is kept traveling by the pump in endless circuit and the same liquid can be used over and over without waste, if so desired.

In this connection, I provide means whereby the chips can be strained or filtered from the cooling liquid before it is again discharged into the interior of the base.

For instance, in the example illustrated, I show transverse openings through the side walls of the base above the bottom thereof and below the opposite ends

of the drum. In these openings, I secure open top pans 146 projecting to the exterior of the base and within the base having open bottoms covered by screens 147, so that the liquid dropping from the cutter disk and from the drum will fall into these pans and will pass down through the screens into settling chambers 148, and overflow therefrom back into the base. The screens will separate the chips from the liquid and the chips can be raked or otherwise removed through the outer ends of the pans.

The machine of this invention has been particularly designed for constant hard service and exceedingly rapid work, and to drive the cutters at both feeds and speeds not possible with machines now on the market. In other words, to drive the cutters at their full capacity as to speed and consequent temperature, without injury to the machine and without chattering or injurious vibration.

I have specifically described various features of the machine for the sake of clearness and to set up what I now consider my preferred embodiment, but I do not thereby intend to limit my invention.

It is evident to those skilled in the art that various changes, modifications and variations might be omitted, or that structures might be added without departing from the spirit and scope of my invention and hence I do not wish to limit myself to the particular constructions or arrangements described but consider myself entitled to all variations falling within the spirit and scope of my invention.

In Figure 3, the shaft 86 is shown between the shaft 101 and the hand wheel 89, whilst in Figure 1 the shaft 101 is arranged between the shaft 86 and the hand wheel 89; either arrangement can be employed as desired.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. Improvements in and relating to cutting off machines and the like characterised by a rotating cutting element and means for carrying or feeding the same across the work, the cutting element having a central work receiving opening and exterior rotating means, and around said central work receiving opening provided with removable cutters.

2. Cutting off machines and the like, characterised by a cutting element comprising a large gear wheel having a driving pinion, said gear wheel having a hollow hub the bore of which is spanned by a blade having a central work receiving opening and carrying renewable or removable cutters projecting into said opening, substantially as and for the purposes described.

3. Metal cutting off machines and the like characterised by a high speed drive for "high duty" steel cutters comprising an exteriorly driven rotating member, having a central work receiving opening, carrying the removable "high duty" steel cutters projecting into said central opening.

4. Cutting off machines and the like characterised by an exteriorly driven rotary blade having a central work receiving opening, and renewable, removable cutters wedged to the blade and arranged around and projecting into said opening.

5. Cutting off machines characterised by a large gear wheel rotated by a pinion and provided with a hollow hub mounted in boxes on both sides of the gear wheel and spanned by a blade secured to an edge of the hub completely around its peripheral portion and a central work receiving opening, and a series of uniformly spaced removable cutters secured to the blade around and projecting into said opening, said hub boxes being mounted in a feed carriage provided with feeding means.

6. In the cutting off machine of Claim 1, the blade having a work receiving opening and renewable or removable "high duty" steel cutters.

7. In cutting off machines the blade provided with removable cutters and a drive substantially as shown by Figure 10 of the drawings.

8. In cutting off machines the hollow hub and its exterior driving gear, and blade and cutters substantially as shown by Figures 3 and 4 of the drawings.

9. In cutting off machines the hollow hub carrying the cutting element and having an exterior drive, combined with a feed carriage having journal boxes for said hub and a box and lubricating means for said exterior drive and hub.

10. In the cutting off machine of Claim 1, a feed carriage carrying the gear and its hollow hub and provided with a lubricating system substantially as shown by Figures 3 and 4 of the drawings.

11. In the cutting machine of Claim 1, the pinion shaft mounting and arrangement substantially as shown by Figures 3 and 5 of the drawings.

12. In the cutting off machine of Claim 1, a clutch mechanism and actuating means and arrangements substantially as shown by Figure 5 of the drawings.

13. In the cutting off machine of Claim 1, the main clutch control substantially as shown by Figures 1 and 5 of the drawings.

14. In the cutting off machine such as described by Claim 1, the housing 75, substantially as shown by Figures 7 and 8.

15. In a cutting off machine such as described by Claim 1, a feed carriage carrying the cutting element, the driving motor, the mechanism for rotating the driving element and the feed transmission substantially as described and shown.

16. In a cutting off machine, the feed carriage mounting and adjustment substantially as shown by Figures 6 and 6ª, of the drawings.

17. In a cutting off machine the hollow base for the feed carriage substantially as shown by Figures 1, 3 and 4 of the drawings.

18. In a cutting off machine such as described by Claim 1, the general arrangement of the base and feed carriage substantially as described and shown.

19. In a cutting off machine such as described by Claim 1, a work vise carried by the base, and a trough such as 115.

20. In a cutting off machine, generally such as described by Claim 1, means for drawing cooling liquid from the hollow base and discharging the same onto the rotating cutting element and the work and returning the same to the base, substantially as described and shown.

21. In a cutting off machine generally as described by Claim 1, the work raising and lowering roller or other support 139.

22. In a cutting off machine generally such as described by Claim 1, the housings 19 for the rollers carrying the feed carriage.

23. In a cutting off machine generally such as described by Claim 1, the chip pan 146, substantially as described and shown.

24. In a cutting off machine generally such as described by Claim 1, a work trolley substantially as shown by Figures 1 and 4.

25. In a cutting off machine generally as described by Claim 1, the work trolley and its clamping and operating means substantially as shown by Figure 9.

26. In a cutting off machine the means substantially as shown by Figures 1, 4 and 9, for gauging the length of stock or work to be fed forward to the cutting element, substantially as described and shown.

27. In a cutting off machine such as described by Claim 1, a high speed drive for "high duty" renewable steel cutters, substantially as described and shown.

28. A cutting off machine substantially as herein described and shown in the accompanying drawings.

Dated this 23rd day of August, 1910.

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